



Gesture / movement / action

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Gesture / movement / action

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In the context of virtual reality systems, and, further, in the context of enactive interfaces, the terms action, movement, and gesture, progressively occupy a more and more important place. Their interrelations benefit from being clarified.

Action...

Commonly speaking, the term action refers to different meanings. It can state both a physical task performed by the human body, or the way through which this task is performed. Smyth and Wing distinguish three levels in performing an action: action refers to what is done (e.g. drink a glass, pick a pencil...), movement refers to how it is done (the movement with which the glass is drunk...) and skill refers to the quality of the movement (how the movement is) [Smyth & Wing 1984].

A given action can hence be acted by several movements, and a movement can be

coloured by several skills. These definitions do not correspond easily to the daily uses of such terms. As a matter of fact, the uses of these terms are nothing else than unclear. Action is often used to name both the task performed and the movement to perform the tasks. Movement, as for it, is actually more general than the movement-in-the-action, and skill refers also to the ability to do something.

Action and Movement...

A first distinction between action and movement is that actions can be described at a high symbolic level, whereas movements cannot. In computer representations, for example, actions can be described by language, or by means of event-based representations. A classical example of event-based representation of actions is the MIDI standard. Types of actions that can be represented are the so-called symbolic gestures, such as for example leaf-and-dumb sign language.

Conversely, movement (or motion) requires to be represented as temporal signals, i.e. a data (position, velocity, etc.) evolving along time. Indeed, movement (or motion), as the moving in space of a part or of the totality of a system, is an explicit spatio-temporal phenomenon. Movement (or motion) refers to the evolution along time of a physical system: human body, mechanical objects, virtual objects, etc. One can speak as well of the motion of a human body, of a leaf, of a sounding source, etc.

Movement and Gestures ...

Similarly with the differentiation between action / movement, and although all the types of gestures convey always information, nevertheless, there exist two types of gestures:

- Gestures that can be represented by language or symbolic representations, often called “symbolic gestures”, or high-level gestures [→ Motion control, high-level] in computer representations. Examples are leaf-

and-dumb sign language, keyboard writing, etc;

- And gestures that cannot, such as instrumental musical playing, gestures of craftsmen, etc., that can be called non-symbolic gestures. There is evidence of proximity between movement (motion) and non-symbolic gestures (or performance gesture), when the body that is moving is the human body. The frontier between movement and gestures is then very fuzzy. The only difference we can state is that movement is general and can be used for any type of system, whereas gesture is usually reserved to humans’.

Artificial electrical and digital machines introduce necessarily an input-output paradigm [→ Channel, afferent / efferent]. In such context, objects, either real or virtual, are equipped by sensors and/or actuators, to be observed or to act on each other.

This shift leads to a new operational differentiation between motions and gestures based more on the differentiation between input and output functionalities, than on the nature of the evolving system that produces the signals. This technological basis allows making a clearly-cut distinction between two aspects of gestures, that are mixed, integrated and non separable when performed by human body:

- When one points to all the motions that can be applied as an input signal, i.e. as a “cause of a performance”, whatever the producing system is (human beings or other objects). In that case, the motion of the body serves to produce something – for example when playing violin – and then the term gesture is more appropriate.
- When one points to all the motions that is the output of an evolving system, whatever this producing system is (human beings or other objects). In that case, the attention is put on the result of the performance and the term motion is then more appropriate, such as when this result is the motion of an object (like when an object is pushed by

a human gesture) or the motion of the body itself (such as in dance performance).

... Gestures

In the continuity of these discussions and in conformity with the Gibson’s analysis of the development on human haptic apparatus, Cadoz [Cadoz, 2000] proposes to name gesture all what the human physical body can physically perform, whatever the performed objective is, rather than action or movement. Declining the different terms necessary to speak about the components of the gesture and gesture activity, he defines:

- gestural channel [→ Gestural channel]: all the sensory-motor apparatus composed of all the physical means, through which the human physical body interacts with the physical external universe: hand, body equipped with all its mechanoreceptors and all its actuators. The gestural channel is then a compact word to name all the human biomechanical sensors-actuators involved in physical motor performances.
- gestural action: the motor part of the gestural channel involved in the gestural performance. It involves all the physical components (articulated skeleton and muscles) of body.
- gestural perception: is the part of the sensory system involved with the gestural channel.

References

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Motion control, high-level